

## PERITONEAL DIALYSIS CATHETER PLACEMENT USING A REGIONAL ANESTHESIA TECHNIQUE: ULTRASOUND-GUIDED TRANSVERSUS ABDOMINIS PLANE BLOCK

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Peritoneal dialysis (PD) is an established method for renal replacement therapy in patients with end-stage renal disease (ESRD). Transversus abdominis plane (TAP) block is a regional anesthesia technique, since recently used for PD catheter placement. The main aim of this study was to evaluate the efficacy of PD catheter placement using ultrasound-guided TAP block. We studied 43 ESRD patients from our center that underwent PD catheter placement under TAP block between June 2011 and December 2014. TAP block was successful in 38 (91.4%) of 43 patients. The remaining five (8.6%) patients required general anesthesia. All procedures were performed without complications. ESRD patients have a substantially greater number of comorbid conditions compared to general population, many of which are adversely influenced by general anesthesia. Opposite to general anesthesia, regional anesthesia has no systemic effect and using this technique may prove beneficial in this group of patients. In conclusion, TAP block is an effective method for PD catheter placement and should be especially considered in ESRD patients with major comorbidities.

**Key words:** end-stage renal disease, peritoneal dialysis catheter, regional anesthesia, transversus abdominis plane block

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### INTRODUCTION

The number of patients with end-stage renal disease (ESRD) is continuously growing worldwide<sup>(1)</sup>. Peritoneal dialysis (PD) is an efficacious treatment modality in patients with ESRD<sup>(2)</sup>. Patients with ESRD present a challenge to anesthesiologists and surgeons due to the increased number of comorbidities. PD catheter placement can be conducted using different surgical approaches. However, some type of anesthesia is required. Transversus abdominis plane (TAP) block is a form of regional anesthesia<sup>(3-5)</sup>. Using this technique, analgesia of the skin, muscles and parietal peritoneum of the anterolateral abdominal wall is achieved. The aim of this study was to present our experience with PD catheter placement using the ultrasound-guided TAP block.

### PATIENTS AND METHODS

Peritoneal dialysis catheter placement using the ultrasound-guided TAP block was performed in a group of ESRD patients without any contraindication for the procedure. All patients were from our center. The patients were followed during the first postoperative month for anesthesia-, surgery- or catheter-related complications. Demographic characteristics, underlying renal diseases, and pre-existent chronic comorbidities were identified based on history and clinical data and previous medical records. ESRD was defined as a permanent, irreversible loss of renal function and glomerular filtration rate less than 15 mL/min/m<sup>2</sup>.

All patients were informed about the planned anesthesia

and surgery technique and signed their informed consent. Preoperatively, all patients received low molecular weight heparin and cefazolin 1 gram intravenously. The patient was placed in supine position. The skin was disinfected with antiseptic solution. In all patients, a combined ultrasound-guided subcostal and posterior approach was used, as previously described<sup>(6,7)</sup>. TAP block was performed using both approaches with a total amount of 30 mL of 0.5% levobupivacaine hydrochloride or 30 mL of 0.75% ropivacaine, depending on the anesthesiologist's preference. Approximately 30 minutes after injecting the anesthetic, the operation commenced. Just before skin incision, all patients received additional drugs such as sufentanil (10 mcg) and/or propofol (0.1-0.2 mg/kg) for better analgesic/sedation effect. Open approach was used as surgical technique in all patients.

Patients were followed for anesthesia-, surgery- or catheter-related complications during the first postoperative month. Continuous ambulatory peritoneal dialysis (CAPD) was started one month after PD catheter placement.

The use of medical records was approved by the Ethics Committee of the Rijeka University Hospital Center. Informed consent was obtained from all patients. The study was in adherence with the Declaration of Helsinki.

## RESULTS

Between June 2011 and December 2014, a PD catheter (straight, double-cuff, Tenckhoff type) was placed using TAP block in 43 ESRD patients. The mean age of our patients was 60.81 (range 37-84) years and mean body mass index 27.12 (range 19.6-37.4) kg/m<sup>2</sup>. The cause of ESRD was chronic glomerulonephritis in 15 (34.9%), diabetes in seven (16.3%), vascular disease in six (13.9%), polycystic kidney disease in four (9.3%), interstitial nephritis in three (6.9%) and unknown origin in eight (18.7%) patients. All patients had comorbidities: hypertension in 43 (100%), congestive heart failure in 13 (30.2%), diabetes in 12 (27.9%) and peripheral vascular disease in six (13.9%) patients. A catheter was placed in 28 male and 15 female patients. In 40 (93.1%) patients, TAP block was performed using 30 mL of 0.5% levobupivacaine hydrochloride, whereas in three (6.9%) patients, 30 mL of 0.75% ropivacaine was used. The TAP block was successful (no need of general anesthesia) in 38 (91.4%) patients. The remaining five (8.6%) patients had pain at the incision site and general anesthesia had to be used. The mean duration of the operation was 41.63 (range 25-70) minutes. Peristalsis was present continuously in all patients, without any stool disruption. Fourteen (32.5%) patients required postoperative analgesics (tramadol) on the first postoperative day. The mean hospital stay was 5.17 (range 4-7) days. The postoperative course was uneventful in all patients, without any anesthesia-, surgery-

or catheter-related complications in the first postoperative month. All patients successfully started CAPD four weeks after PD catheter placement.

## DISCUSSION

Dialysis is the best established mode of mechanical organ replacement therapy. Compared to hemodialysis (HD) patients, PD patients seem to be much more satisfied, based on the quality of life during treatment, and preference of PD may be more advantageous in the pre-transplantation period. There is survival advantage for PD patients over the first 1-2 years after the onset of dialysis, with better preservation of residual renal function. Moreover, much lower doses of erythropoietin have been shown to be sufficient in PD patients<sup>(8)</sup>.

Since PD catheter placement is a surgical procedure, some kind of anesthesia is required. Local anesthesia is preferred in patients with significant comorbidities; however, it has some limitations (edema and bleeding at the incision site and need for repeating injections). The most utilized anesthesia technique for PD catheter placement is general anesthesia with all its risks. Using regional anesthesia has just been started for PD catheter placement<sup>(6)</sup>.

The use of TAP block for insertion of PD catheter was firstly described by Varadarajan *et al.*<sup>(9)</sup>. Their study included 73 patients and the technique was effective in 60 (82%) patients. In contrast to our technique of using TAP block only, they used combined TAP and rectus sheath block.

Chatterjee *et al.*<sup>(10)</sup> analyzed 52 patients, of which 41 did not require additional analgesia. Eleven patients complained of pain at the skin incision site and received local anesthetic. Only three patients continued to complain of pain and were administered fentanyl as additional analgesia. There was no need for general anesthesia in any patient.

Complications of TAP block are very rare. As for other peripheral nerve blocks, the complications include nerve injury, injection site bruising, infection and allergic reaction. Other possible complications include spleen, kidney and bowel injury. In our patients, there were no complications related to anesthesia, surgery or PD catheter. Hecquet *et al.* report its early postoperative complications: hematoma in 11% and hemoperitoneum in 3% of patients<sup>(11)</sup>.

Patients with ESRD have a substantially higher number of comorbid conditions compared with general population, including coronary artery disease, congestive heart failure, hypertension, cerebrovascular disease, peripheral vascular disease, diabetes mellitus, lung disease, and peptic ulcer disease. The aforementioned conditions are associated with a significantly higher mortality rate among HD patients<sup>(12,13)</sup>. General an-

esthesia can produce significant effects on the cardiac, vascular and pulmonary systems. As direct cardiac and pulmonary effects of regional anesthesia are negligible, this type of anesthesia can be recommended for ESRD patients<sup>(14)</sup>.

In our opinion and in concordance with our experience, TAP block can be used as the main anesthesia technique for PD catheter placement. Because ESRD patients have a high number of comorbidities, avoiding general anesthesia by using TAP block can be recommended.

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## SAŽETAK

### POSTAVLJANJE KATETERA ZA PERITONEJSKU DIJALIZU PRIMJENOM REGIONALNE ANESTEZIJE: ULTRAZVUČNO VOĐENI TAP BLOK

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Peritonejska dijaliza (PD) je učinkovita metoda nadomjesne terapije bubrežne funkcije u bolesnika koji se nalaze u terminalnom stadiju bubrežnog zatajenja (ESRD). Transversus abdominis plane (TAP) blok spada u regionalnu anesteziju i nedavno se počeo primjenjivati i kod implantacija katetera za PD. Cilj ove studije bio je procijeniti učinkovitost postavljanja katetera za PD uz pomoć ultrazvučno vođenoga TAP bloka. Analizirali smo 43 bolesnika s ESRD iz našega centra u kojih je postavljen kateter za PD uz pomoć TAP bloka između lipnja 2011. i prosinca 2014. godine. TAP blok bio je uspješan u 38 (91,4%) od 43 bolesnika. U ostalih pet bolesnika bilo je potrebno primijeniti i opću anesteziju. Svi zahvati su prošli bez komplikacija. Bolesnici s ESRD imaju značajan i uvećan broj popratnih bolesti u odnosu na opću populaciju, od kojih se mnoge mogu pogoršati djelovanjem opće anestezije. Za razliku od opće anestezije, regionalna anestezija nema sistemskog učinka te uporaba ove tehnike može biti korisna u ove skupine bolesnika. Zaključno, TAP blok je učinkovita metoda kod postavljanja katetera za PD, pogotovo u bolesnika s ESRD koji imaju brojne popratne bolesti.

**Ključne riječi:** terminalni stadij bubrežnog zatajivanja, kateter za peritonejsku dijalizu, regionalna anestezija, transversus abdominis plane blok